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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification⁶ :

B29D 30/46, B26D 1/04

A1

(11) International Publication Number:

WO 00/03866

(43) International Publication Date:

27 January 2000 (27.01.00)

(21) International Application Number: PCT/US98/14908

(22) International Filing Date: 17 July 1998 (17.07.98)

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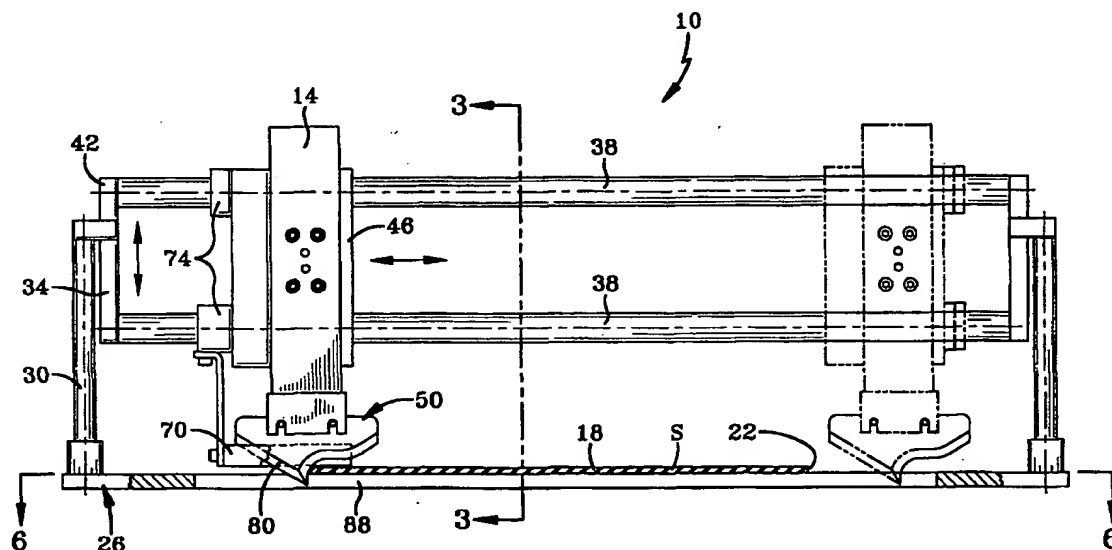
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(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR,
BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE,
GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ,
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UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM,
KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ,
BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE,
CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC,
NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,
GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

(54) Title: METHOD AND APPARATUS FOR CUTTING TIRE PLY STOCK



(57) Abstract

Method and apparatus for severing tire ply stock (S) wherein the apparatus includes a knife assembly (14) utilizing a blade (50) having a curved leading edge (58) and a straight trailing edge (62) which meet at a leading point (66). The ply stock (S) is supported by a slotted anvil (26) in the area immediately adjacent a cut line. In operation, the knife assembly (14) is lowered and the leading point (66) pierces the ply stock (S) between adjacent cords. During the downward stroke, the trailing edge (62) back-cuts the ply stock (S) from the insertion point (98) to a first lateral edge (18). The leading edge (58) severs the remainder of the ply stocks (S) as the knife assembly (14) traverses the ply stock to a second lateral edge (22).

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METHOD AND APPARATUS FOR CUTTING TIRE PLY STOCK

Technical Field

This invention pertains to methods and apparatus for cutting tire ply stock and the like.

5 Background Art

Different apparatus and methods have been utilized in order to provide cut-to-length sections of ply stock used for building tires. In U.S. Patent Nos. 3,429,490 and 3,641,855, apparatuses which utilize plunging knives are disclosed. In these apparatuses, a pair of knives is used to transpierce the ply stock at the center of the ply. Then each knife is moved to an
10 opposite lateral edge of the ply stock. The cuts are made from the center outward in order to avoid crushing the lateral edges of the ply stock. A disadvantage of these apparatuses is that the two knives must cut between the same pair of adjacent cords.

In U.S. Patent No. 3,789,712 a single knife blade is used. The blade is moved into a first edge of the ply which is lifted from the conveyor up against a stock support and held there by the
15 oblique cutting edge while the knife blade makes its cutting stroke. This is an attempt to cut the ply without plunging the knife or using two cutters. A disadvantage of this type of cutter is that the lateral edge of the ply stock is subjected to an inwardly directed cut and damage to the edge may occur.

U.S. Patent No. 4,156,378 discloses an apparatus which uses a circular rotatable disc
20 cutter to engage a hard surface of an anvil and then roll on the surface to part the ply stock between a pair of cords. Again, the lateral edge is subjected to an inwardly directed cut.

The present invention provides a method and apparatus for severing ply stock between adjacent cords without the use of two separate knife blades in a way that does not damage lateral edges of the ply stock.

25 Disclosure of Invention

In accordance with the practice of the present invention, there is provided a new and improved method and apparatus for severing a belt package and the like to a predetermined length at a desired bias angle which employs a heated knife blade to facilitate clean cutting of the belt package between adjacent cords.

30 More particularly, in accordance with one aspect of the present invention, a method for cutting an associated ply stock is provided wherein the ply stock is severed along a cut line using a cutting apparatus comprising a knife assembly which is moved toward and away from the ply stock, and is traversed between first and second lateral edges of the ply stock. The knife assembly includes a blade having a cutting portion including a leading point, a leading edge, and

a trailing edge. The method is characterized by the steps of inserting the leading point of the knife blade into the ply stock at an insertion point immediately adjacent a first lateral edge of the ply stock, back cutting the ply stock with the back edges of the knife blade from the insertion point to the first lateral edge during the insertion step, and then traversing the knife assembly to a second lateral edge while cutting the ply stock with the front edge of the knife blade.

According to another aspect of the present invention, the cutting assembly includes a slotted anvil. The slot in the anvil is aligned with the cut line and the method is further characterized by the step of inserting the leading point of the knife blade into the slot in the anvil.

According to a further aspect of the invention, the trailing edge has an associated length L, and the distance from the insertion point to the first lateral edge is less than or equal to the length L.

One advantage of the present invention is that the ply stock can be cut between adjacent cords without severing either cord.

Another advantage of the present invention is that the ply stock can be severed without damaging either lateral edge of the ply stock.

Still other benefits and advantages of the invention will become apparent to those skilled in the art upon a reading and understanding of the following specification.

Brief Description of Drawings

The invention may take physical form in certain parts and arrangement of parts, a preferred embodiment of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein:

Figure 1 is a front view of one embodiment of the present invention with the knife blade inserted into the ply stock and showing the knife assembly at the end of the cutting stroke in phantom lines.

Figure 2 is an enlarged view of the knife blade shown in Figure 1 prior to insertion of the knife blade.

Figure 3 is a side view in section of the embodiment taken along the line 3-3 of Figure 1.

Figure 4 is a side view of the knife blade shown in Figure 2 taken along line 4-4.

Figure 5 is a partial view like Figure 2 showing the knife blade after insertion through the ply stock.

Figure 6 is a top view of the slotted anvil shown in Figure 1.

Figure 7 is a cross-sectional view of the anvil taken along line 7-7 in Figure 6.

Figure 8 is a cross-sectional view of the ply stock showing the knife blade inserted between a pair of embedded cords.

Figure 9 is an enlarged view of the knife blade showing the configuration of the cutting edges of the blade.

Detailed Description of the Invention

Referring now to the drawings wherein the showings are for purposes of illustrating a preferred embodiment of the invention only and not for purposes of limiting the same, Figure 1 shows an apparatus 10 for severing tire building sheet material, referred to herein as ply stock S. The apparatus 10 includes a knife assembly 14 which is mounted to means for moving the knife assembly toward and away from the ply stock to be cut. The apparatus 10 further includes means for moving the knife assembly 14 across the ply stock from a first lateral edge 18 thereof to a second lateral edge 22. The apparatus 10 also includes an anvil 26 for supporting the ply stock S in the immediate area below a cut line A-A. The embodiment of apparatus 10 is shown in Figures 1, 2, and 3 for illustrative purposes only and not by means of limiting the invention. In the preferred embodiment, the apparatus 10 includes a frame 30, an anvil 26, a carrier 34 including guide bars 38 extending between end support members 42, and a carriage 46. The carrier 34 is mounted on the frame 30 for movement toward and away from the anvil 26. The carriage 46 is mounted slidably along the bars 38 of the carrier 34 to traverse the knife assembly 14 between end members 42. A suitable mechanism (not shown), such as a pneumatic cylinder, may be provided for moving the carrier 34 toward and away from the anvil 26. Likewise, a suitable mechanism, such as a chain drive (not shown) may be provided for traversing the carriage 46 along guide bars 38. The ply stock S to be severed may be supported and moved in the direction shown by the arrow in Figure 3 by any suitable conveyor (not shown). Preferably, the conveyor advances the ply stock S by successive predetermined increments thereby providing uniform lengths of ply stock suitable for their intended application. The relative positioning of the members of apparatus 10 just before a cut is made is referred to herein as "home position" 48 and is illustrated in Figure 2. At home position 48, the knife assembly 14 is positioned above the first lateral edge 18 of ply stock S.

With reference to Figure 2, one embodiment of a knife assembly 14 according to the present invention is shown. The knife assembly 14 includes blade 50 having a cutting portion 54 including leading edge 58 and a trailing edge 62 which meet at leading point 66. Leading

point 66 is used to penetrate the ply stock S upon downward movement of the knife assembly 14. In the preferred embodiment, the knife blade 50 is "hawk-billed" in shape with the leading edge 58 being curved in profile as shown in Figure 2, and the trailing edge 62 presenting a straight profile. As best shown in Figure 4, the cutting portion 54 of the blade 50 is tapered to effectively cut ply stock S. Both the leading edge 58 and the trailing edge 62 are tapered in the preferred embodiment.

As shown in Figure 2, the trailing edge 62 of the knife blade 50 has a length, L, measured in a direction parallel to the direction of the blade traverse from leading point 66 to trailing end 68 that is equal to or greater than distance D from insertion point 92 to first lateral edge 18 of the ply stock S.

The preferred embodiment of the cutting apparatus 10 further includes means such as electric resistance heaters 70 for heating the knife blade 50 before each successive cutting operation. As shown in Figure 1, in the preferred embodiment, the heaters 70 are secured to carrier 34 and do not traverse the ply stock S. The heaters 70 are positioned so that when the carriage 46 is positioned against left spacers 74 on the guide bars 38, the knife blade 50 is adjacent heaters 70 to enable the blade 50 to be heated before each successive cut. In the preferred embodiment, heater 70 is bifurcated to heat both sides of blade 50.

One embodiment of an anvil 26 for use with the present invention is shown in Figure 6 and Figure 7. The anvil 26 includes a sloping side 80 and support surface 84 having a slot 88 therein. During a cutting operation, the slot 88 is generally aligned with the cut line indicated by A-A in Figure 6.

The preferred method for cutting the ply stock S is set forth below. The ply stock S may include embedded cords 118. As shown in Figure 8, it is important that the ply stock S be cut between the adjacent cords 118 in a way that prevents exposing a bare cord or damaging either of the adjacent cords. It is also important that the lateral edges of the ply stock S be protected from damage which can occur when the lateral edge of the ply stock is crushed when the ply stock is cut from the outer edge inwardly. In operation, the ply stock S is positioned beneath the knife assembly 14. The ply stock S is supported in an area immediately adjacent the cut line by the support surface 84 of anvil 26. The slot 88 in the support surface 84 is aligned with the path the knife blade 50 will travel. The ply stock S is held in the cutting position by use of holding means such as a holding assembly (not shown). The knife blade 50 is pre-heated. The knife assembly 14 is then moved downwardly toward the ply stock S to bring the leading point 66 of

the knife blade 50 into contact with the ply stock S. The heated knife blade 50 softens the ply stock S so that the leading point 66 of the knife blade may be plunged through the ply stock S at an insertion point 92 and into the slot 88. The insertion point 92 is located near a first lateral edge 18 of the ply stock S. On the downward stroke, as the knife blade 50 enters the ply stock S, the trailing edge 62 of the blade back-cuts the ply stock from the insertion point 92 to the first edge 18. The knife assembly 14 is then moved across the remaining width of the ply stock, while the leading edge 66 of the knife blade 50 severs the ply stock. The knife blade 50 cooperates with the slotted anvil 26 to perform the severing operation. Minor adjustments in the cord positioning during the cutting process is done by the action of the blade 50 within the slot 88 in order to prevent split cords. After the second lateral edge 22 is traversed, the knife assembly 14 is lifted away from the ply stock S. The cut length is then moved away from the anvil 26 in preparation for a successive cutting operation. The knife assembly 14 is returned to a "home" position 48 as shown in Figure 3 where the blade 50 is heated again before beginning the next cut.

The preferred embodiment of the blade 50 is shown in Figure 9. There are several aspects of the preferred blade design which provide advantages over blades known in the art. For example, as the knife blade 50 is plunged into the ply stock S, the leading point 66 prevents movement of the blade 50 away from the lateral edge. The trailing edge 62 of the blade makes an angle α with the plane S-S of the ply stock S in order to back cut the ply stock from the insertion point to the first lateral edge. In the preferred embodiment, α is 30 degrees but may be in the range from 20 degrees to 40 degrees. The knife blade 50 is further characterized by the leading edge 58 having both a concave portion 120 and a convex portion 122 that meet at inflection point 124. The leading edge 58 makes an angle β with the plane S-S at the point of insertion which is preferably 90 degrees but may be from 70° to 90°. The leading edge 58 makes an angle θ with the plane S-S at a position X spaced from the plane of the ply stock S-S as shown in Fig. 9 a distance greater than the thickness of the ply stock so that as the knife assembly traverses the remaining width of the ply stock S, the curvature of the leading edge 58 acts to cut the ply stock S and urge the ply stock S toward the anvil 26. Preferably the angle θ is 60 degrees but may be in the range of 40 degrees to 70 degrees.

The preferred embodiments of the invention have been described, hereinabove. It will be apparent to those skilled in the art that the above method and apparatus may incorporate changes and modifications without departing from the general scope of this invention. It is intended to

include all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof.

Having thus described the invention, it is now claimed:

CLAIMS

1. A method for cutting an associated ply stock along a cut line using a cutting apparatus comprising a knife assembly, means for moving said knife assembly normally toward and away from said ply stock, and means for traversing said knife assembly between a first lateral edge and a second lateral edge of said ply stock, said knife assembly including a blade having a cutting portion including a leading point, a leading edge and a trailing edge, said trailing edge having an associated length L, said ply stock having spaced first and second lateral edges, the method characterized by the steps of:

a. moving said knife assembly toward said ply stock to insert the leading point of said knife blade into said ply stock at an insertion point spaced a distance D from said first lateral edge wherein distance D is less than or equal to length L in order to back-cut said ply stock from said insertion point to said first lateral edge with said trailing edge of said blade; and,

b. traversing said knife assembly across said ply stock toward said second lateral edge in order to cut said ply stock from said insertion point to said second lateral edge with said leading edge of said blade and provide severance of said ply stock from said first lateral edge to said second lateral edge.

2. The method of claim 1 wherein the cutting apparatus further includes an anvil having a slot in a support surface, said slot being generally aligned with the cut line, the method further characterized by the steps of:

a. inserting said leading point of said knife blade into said slot in said anvil after inserting said leading point into said ply stock; and,

b. maintaining said leading point within said slot while said knife assembly traverses said ply stock.

3. The method of claim 1 wherein said cutting apparatus further includes means for heating said knife blade, the method further characterized by the step of:

heating said knife blade before inserting said leading edge into said ply stock.

4. The method of claim 3 further characterized by the step of:

maintaining said heating means near said first lateral edge of said ply stock during the traversing of said knife assembly.

5. The method of claim 1 wherein said leading edge of said knife blade includes a concave portion, the method further characterized by:

engaging said concave portion of said leading edge with said ply stock after inserting said leading point into said ply stock.

6. A knife assembly for use in a cutting apparatus for cutting an associated ply stock along a cut line, said knife assembly including a blade having a cutting portion including a leading point, a leading edge and a trailing edge, said knife assembly characterized by:

- a. said leading edge of said blade including a concave portion; and,
- b. said trailing edge of said blade having a generally linear profile.

7. The knife assembly of claim 6 wherein said knife assembly is further characterized by: said leading edge of said blade including a convex portion, said convex portion meeting said concave portion at an inflection point.

8. The knife assembly of claim 6 wherein said knife assembly is further characterized by: said trailing edge being inclined at an angle α from 20 to 40 degrees to the plane of the associated ply stock at the cut line.

9. A cutting apparatus for cutting an associated ply stock along a cut line between first and second lateral edges, said apparatus comprising a knife assembly, means for moving said knife assembly toward and away from said ply stock, and means for traversing said knife assembly between said first and second lateral edges of said ply stock, said knife assembly including a blade having a cutting portion including a leading point, a leading edge and a trailing edge, said trailing edge having an associated length L, said cutting apparatus being characterized by:

said knife assembly having a home position wherein said leading point of said blade is directly above an insertion point of said associated ply stock and wherein a distance D between said first lateral edge of said associated ply stock and said insertion point is less than or equal to said associated length L of said trailing edge.

10. The cutting apparatus of claim 9 further characterized by:

an anvil positioned below said knife assembly and having a slot in a support surface, said slot being generally aligned with said cut line.

11. The cutting apparatus of claim 9 further characterized by:

means for heating said knife blade.

12. A method of cutting a sheet of material from a first lateral edge to an opposite second lateral edge with a knife blade characterized by:

a. plunging said knife blade through said sheet at a first position spaced from said first edge,

b. continuing to plunge said knife through said sheet to cut said sheet from said first position to said first edge; and,

c. moving said knife blade from said first position to said second edge to complete the cutting of said sheet from said one edge to said opposite edge.

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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 98/14908

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B29D30/46 B26D1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B29D B26D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 125 148 A (FIRESTONE TIRE & RUBBER CO) 14 November 1984 see page 24, line 20 - line 35	1,9,12
X	see page 33, line 5 - page 34, line 20 ---	6
X	US 4 131 996 A (JANKE WILLIAM R) 2 January 1979 see figure 3 ---	6
A	US 4 545 275 A (PEARL DAVID R) 8 October 1985 see column 3, line 35 - line 45; figure 3 ---	1,9,12
A	US 3 365 992 A (DREHER DONALD F) 30 January 1968 see figure 2 --- -/--	7



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
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- "O" document referring to an oral disclosure, use, exhibition or other means
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- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

22 February 1999

Date of mailing of the international search report

02/03/1999

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INTERNATIONAL SEARCH REPORT

Int. Patent Application No.

PCT/US 98/14908

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 768 045 A (SHIMA SEIKI MFG) 16 April 1997 ---	
A	DE 12 82 914 B (CONTINENTAL GUMMI-WERKE AG) -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter. Application No

PCT/US 98/14908

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0125148 A	14-11-1984	US 4572046 A BR 8402159 A CA 1231042 A PT 78538 B US 4608890 A ZA 8402461 A	25-02-1986 18-12-1984 05-01-1988 12-05-1986 02-09-1986 28-11-1984
US 4131996 A	02-01-1979	NONE	
US 4545275 A	08-10-1985	DE 3330452 A FR 2540421 A GB 2134837 A,B JP 1025679 B JP 1543241 C JP 59146798 A	16-08-1984 10-08-1984 22-08-1984 18-05-1989 15-02-1990 22-08-1984
US 3365992 A	30-01-1968	NONE	
EP 0768045 A	16-04-1997	JP 9103991 A US 5791216 A	22-04-1997 11-08-1998
DE 1282914 B		NONE	

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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REC'D 11 OCT 2000

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Applicant's or agent's file reference ./.	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US98/14908	International filing date (day/month/year) 17/07/1998	Priority date (day/month/year) 17/07/1998
International Patent Classification (IPC) or national classification and IPC B29D30/46		
Applicant THE GOODYEAR TIRE AND RUBBER COMPANY et al.		



- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 9 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 17/02/2000	Date of completion of this report 09.10.00
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Militzer, E Telephone No. +49 89 2399 2895 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US98/14908

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-6 with telefax of 25/07/2000

Claims, No.:

1-12 with telefax of 25/07/2000

Drawings, sheets:

1/5-5/5 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US98/14908

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-12
	No: Claims
Inventive step (IS)	Yes: Claims 1-12
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-12
	No: Claims

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Independent claims 1, 9 and 12:

The subject matter of claims 1, 9 and 12 is new (Article 33(2) PCT) because no prior art discloses all the method steps and means to perform these steps as defined in these claims. In particular it not known to first move the knife assembly toward the ply stock in a manner to insert the leading point of the blade into the ply stock at a point spaced from the first lateral edge in order to back-cut the ply stock from the insertion point to the first lateral edge and then to cut the ply stock by traversing the knife assembly to the second lateral edge.

This procedure of cutting the ply stock and the related means have the advantage that it does not damage the lateral edges of the ply stock. Since the prior art does not suggest to cut the ply stock in the claimed manner it can be concluded that the subject matter of claims 1, 9 and 12 involves also an inventive step (Article 33(3) PCT).

The claims 1, 9 and 12 are also industrially applicable (Article 33(4) PCT).

2. Independent claim 6:

Document US 4 231 996 does not describe a knife assembly wherein the blade includes a concave portion adjacent the leading point of the blade. Document US 3 365 992 does not describes a knife assembly having a cutting portion including a leading point, a leading edge and a trailing edge. The subject matter of claim 6 is new over both documents (Article 33(2) PCT). It cannot be found any suggestion in the prior art to modify the known blade in the claimed manner such that the cutting apparatus can be operated according to the claimed method that is to say in a way that the blade can be first inserted at an insertion point spaced from the first lateral edge. Therefore, the subject matter of claim 6 involves an inventive step (Article 33(3) PCT).

Claim 6 si also industrially applicable (Article 33(4) PCT:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US98/14908

3. Dependent claims:

The features of dependent claims 2 to 5, 7, 8, 10, 11 represent further embodiments which meet also the requirement of the PCT regulation.

Re Item VII

Certain defects in the international application

On page 2, line 14, the word "said" is missing after "adjacent".

Re Item VIII

Certain observations on the international application

Method claims 1 and 12 have been drafted as separate independent claims. Since they refer to a method of cutting wherein the knife is plunged through the sheet at a position spaced from the first edge they appear to relate effectively to the same subject-matter. The aforementioned claims therefore lack conciseness. Hence, claims 1 and 12 do not meet the requirements of Article 6 PCT.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference DN1998124	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 98/ 14908	International filing date (day/month/year) 17/07/1998	(Earliest) Priority Date (day/month/year)
Applicant THE GOODYEAR TIRE AND RUBBER COMPANY et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).
2. ☐ Unity of invention is lacking (see Box II).
3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.

☐ furnished by the applicant separately from the international application.

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ Transcribed by this Authority

4. With regard to the title, ☐ the text is approved as submitted by the applicant
☒ the text has been established by this Authority to read as follows:

METHOD AND APPARATUS FOR CUTTING TIRE PLY STOCK

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

Figure No. 1 ☒ as suggested by the applicant.

☐ None of the figures.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 98/ 14908

Box III TEXT OF THE ABSTRACT (Continuation of it m5 of the first sh et)

Method and apparatus for severing tire ply stock (S) wherein the apparatus includes a knife assembly (14) utilizing a blade (50) having a curved leading edge (58) and a straight trailing edge (62) which meet at a leading point (66). The ply stock (S) is supported by a slotted anvil (26) in the area immediately adjacent a cut line. In operation, the knife assembly (14) is lowered and the leading point (66) pierces the ply stock (S) between adjacent cords. During the downward stroke, the trailing edge (62) back-cuts the ply stock (S) from the insertion point (98) to a first lateral edge (18). The leading edge (58) severs the remainder of the ply stock (S) as the knife assembly (14) traverses the ply stock to a second lateral edge (22).

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/14908

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B29D30/46 B26D1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B29D B26D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 125 148 A (FIRESTONE TIRE & RUBBER CO) 14 November 1984 see page 24, line 20 - line 35	1,9,12
X	see page 33, line 5 - page 34, line 20 ---	6
X	US 4 131 996 A (JANKE WILLIAM R) 2 January 1979 see figure 3 ---	6
A	US 4 545 275 A (PEARL DAVID R) 8 October 1985 see column 3, line 35 - line 45; figure 3 ---	1,9,12
A	US 3 365 992 A (DREHER DONALD F) 30 January 1968 see figure 2 --- -/--	7

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

22 February 1999

Date of mailing of the international search report

02/03/1999

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/14908

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 768 045 A (SHIMA SEIKI MFG) 16 April 1997 ---	
A	DE 12 82 914 B (CONTINENTAL GUMMI-WERKE AG) -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/14908

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0125148	A	14-11-1984	US 4572046 A	25-02-1986
			BR 8402159 A	18-12-1984
			CA 1231042 A	05-01-1988
			PT 78538 B	12-05-1986
			US 4608890 A	02-09-1986
			ZA 8402461 A	28-11-1984

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US 4545275	A	08-10-1985	DE 3330452 A	16-08-1984
			FR 2540421 A	10-08-1984
			GB 2134837 A,B	22-08-1984
			JP 1025679 B	18-05-1989
			JP 1543241 C	15-02-1990
			JP 59146798 A	22-08-1984

US 3365992	A	30-01-1968	NONE	

EP 0768045	A	16-04-1997	JP 9103991 A	22-04-1997
			US 5791216 A	11-08-1998

DE 1282914	B		NONE	
